Measures of the Exterior Diameter of Saturn's Ring.
By Professor Kaiser.

(*Extract of a Letter to the Editor.*)

"At the end of last year I received the double-image micrometer which I had ordered of Mr. Simms, but different circumstances prevented me for a few months from making use of it. A favourable opportunity for employing it first offered itself in the month of March, when I resolved to measure the planet *Saturn* with it. On the 10th of March the sky was tolerably transparent, but cloudy weather then ensued, and it was not until the 25th of the same month that at length there occurred a succession of several clear days. During this time, however, there blew incessantly a strong wind from the north or north-east, accompanied with intense cold; and the air, which was very transparent, was affected with such violent undulations, that *Saturn* appeared like a confused mass of light, so that to execute any exact measures was altogether impossible. Under such circumstances, the complete measurement of *Saturn* with the double-image micrometer being impracticable, I was obliged to wait for more favourable weather, in order to examine M. Otto Struve's theory by my own measures. I thought, however, that in the meantime I might be enabled to contribute something to the examination of the hypothesis communicated by Professor Secchi in the *Monthly Notices*, vol. xvi. No. 3. For this I only wanted to measure the exterior major axis of the outer ring, which is by far the easiest to measure; and I thought that a change in a few hours of nearly a whole second, if it existed, could not fail to reveal itself also to me, notwithstanding the unfavourable condition of the atmosphere.*

"If the air was tranquil for a moment, the micrometer exhibited pretty distinct images; the instrument, however, cannot be used for minute measurements without great circumspection. A principal difficulty appears to me to consist in the circumstance that the result of the measurement depends on the point of the field of view in which the images coincide. The variability hence arising increases with the distance to be measured, and may for a distance not exceeding two minutes produce an error of a considerable part of a second. With the highest magnifying powers, the measurement can therefore hardly be extended to two minutes, but the influence of the variability upon the following measures of *Saturn* is certainly very small.

"Supposing, that the value of a revolution of the screw amounts

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* The author here alludes to an inconvenience which he has experienced in endeavouring to determine by the aid of a wire-micrometer the value of a revolution of the screw for a high magnifying power. Mr. Airy in the description of his double-image micrometer (Introduction to *Greenwich Observations*, 1840), has shown how the value of a revolution of the screw may be obtained independently of the use of a wire-micrometer.—Editor.

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to 6″·430, I obtained for the major axis of the ellipse formed by the outer edge of the exterior ring of *Saturn* the following results :—

1856.	M. T. Leyden.	Major Axis Observed.	Major Axis Reduced to Mean Dist.	Deviation from the Mean.
	h m	″	″	″
March 10	9 23	42·26	39·46	+0·04
	9 48	42·12	39·33	+0·17
25	8 50	40·87	39·23	+0·27
	9 35	41·05	39·40	+0·10
	10 12	41·06	39·41	+0·09
26	7 15	41·21	39·62	−0·12
	9 17	41·30	39·71	−0·21
	10 6	41·20	39·61	−0·11
27	8 32	41·02	39·51	−0·01
	9 41	41·14	39·63	−0·13
	10 12	41·21	39·69	−0·19
28	7 40	40·96	39·52	−0·02
	8 57	40·65	39·22	+0·28
	10 0	40·93	39·49	+0·01
29	7 20	40·80	39·44	+0·06
	8 40	41·07	39·70	−0·20
30	7 20	40·99	39·69	−0·19
	8 40	40·86	39·56	−0·06
31	7 20	40·73	39·50	0·00
	8 35	40·77	39·54	−0·04

Mean, 39·501

"The second measure of the 10th of March was executed by Dr. Oudemans; all the others are by myself.

"All the above measures have been executed under the most unfavourable atmospheric conditions, and it is not to be doubted that the double-image micrometer admits and will furnish in future much more exact measures. It is remarkable that all the above measures accord incomparably much better with each other than those which Professor Secchi has communicated in the *Monthly Notices*, vol. xvi. p. 52. After the application of a correction, that diminishes the differences between his results not less than 0″·732, the latter continue to exhibit deviations from the mean, which are not less than those of my measures without the application of any corrections. My measures, therefore, do not seem to indicate any trace of a fluctuation by which the apparent major axis of the ring increases or diminishes to the extent of 0″·732 in an interval of $7^{\mathrm{h}}{\cdot}214$. A fluctuation in a period of $7^{\mathrm{h}}{\cdot}214$ may remain concealed for weeks if the ring is measured daily at the same hour; for if the ring is measured the first day just in its mean value, this will be nearly the case for many days together at the same hour, and the fluctuation may exist without

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disclosing itself even to accurate measures. My measures, however, have been executed at sufficiently different hours to make such a concealment of the fluctuations almost impossible, and it is not probable that the errors of my measures have followed with precisely the same magnitude the same period in an opposite direction as the change which Secchi thought he had discovered in the major axis of the ring of *Saturn.* I hope to execute under a better condition of the atmosphere more complete and more accurate measures of *Saturn,* but the result of this preliminary inquiry appeared to me sufficiently interesting to communicate it briefly to you.

"*Leyden, April* 3, 1856."

Occultations Observed at the R.N. College, Portsmouth, by Capt. Shadwell, R.N.

1856				M.T. Portsmouth.		
				h	m	s
Feb. 16	45 Geminorum	Mag. 6	Immersion. Dark Limb	11	52	36
Mar. 11	33 Tauri	Mag. 6	Immersion. Dark Limb	9	27	54
,, 13	136 ,,	Mag. 4½	Immersion. Dark Limb	8	48	31
,, 26	α Scorpii	Mag. 1½	Immersion. Bright Limb	15	20	50·5
			Emersion. Dark Limb	16	39	50·5

All good observations. In the case of *α Scorpii,* the star at the immersion appeared to hang on the moon's limb for about two seconds; the time recorded is that of final disappearance. The reappearance was instantaneous.

Note on a presumed Occultation of a Star by Saturn.

By Frederick Brodie, Esq.

"On 30th January observed *Saturn,* and was surprised to find that there were apparently four satellites plainly visible interior to *Titan.* I could glimpse a fifth occasionally. After a period of 2½ hours, I perceived that the one nearest the planet, then about 30″ distant from the edge of the ball, had not moved, but rather approached the planet; while the satellite next to it, *Tethys,* had altered its position with respect to it nearly 90°. I suspected it therefore to be a star, its brightness and magnitude coinciding exactly with one of the interior satellites.

"On 31st January I observed this supposed star about 100″ distant from the edge of the ball of *Saturn* but on the opposite side; the satellites, *Enceladus, Tethys, Dione, Rhea,* were visible, and in the respective proper positions due to their daily revolutions. This star had been occulted by the planet during the inter-